

REPORT ON
REMEDIAL RESPONSE IMPLEMENTATION PLAN
RUGGLES CENTER - BUILDING 2
BOSTON, MASSACHUSETTS
DEP CASE NO. 3-0739



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RUGGLES CENTER - BUILDING 2
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DEP CASE NO. 3-0739

by

Haley & Aldrich, Inc.
Cambridge, Massachusetts

for

F.R. Harris, Inc.
Boston, Massachusetts

File No. 10003-43
August 1992



11 August 1992
File No. 10003-43

F.R. Harris, Inc.
66 Long Wharf
Boston, Massachusetts 02110

Attention: Mr. Ira Levy

Subject: MCP Phase IV - Remedial Response
Implementation Plan
Ruggles Center - Building 2
Boston, Massachusetts
DEP Case No. 3-0739

Gentlemen:

We are pleased to present this report which represents the MCP Phase IV - Remedial Response Implementation Plan (RRIP) for Ruggles Center - Building 2.

The RRIP was prepared in accordance with the Massachusetts Contingency Plan (MCP), Subsection 310 CMR 40.547, and provides implementation procedures for the recommended remedial alternative presented in the "Report on Final Remedial Response Plan (FRRP), Parcel 18 and 18B, Boston, Massachusetts," dated 24 July 1992, by Haley & Aldrich, Inc. This RRIP was prepared for the first phase of development of Ruggles Center, which includes Building 2 (Registry of Motor Vehicles Building), interim surface parking and the public plaza. Other specific RRIPs, which may include additional or revised implementation procedures, will be required for later phases of development.

SITE LOCATION AND CONDITIONS

The entire Ruggles Center Development site which includes areas to be developed at this time consists of two parcels of land formerly known as Parcel 18 and Parcel 18B (A.K.A. 18-2). The parcels are located in the Roxbury section of Boston, Massachusetts adjacent to the Ruggles Station of the MBTA Orange Line (refer to Figure 1). Parcel 18 is roughly rectangular in shape and is bounded on the east by Tremont Street, on the west by the access road (continuation of Columbus Avenue) and walkway to the MBTA Station, on the north by Melnea Cass Boulevard, and on the south by Ruggles Street (refer to Figure 2). Parcel 18B lies west of Parcel 18 and is bounded on the west by the MBTA

Ruggles Station, on the east by the access road to the MBTA Station, on the north by Melnea Cass Boulevard, and on the south by the Pedestrian Concourse to the MBTA Station.

The site presently consists of vacant land which has been graded, landscaped, and is mostly surrounded by fencing. A few small trees have been planted on the site which is otherwise covered predominantly with grass. Parcel 18 is divided by a paved driveway which joins Tremont Street with the access drive to the MBTA Station.

Surrounding features include the MBTA Ruggles Station to the west, vacant land or parking lots to the north and south, and an apartment building on the opposite side of Tremont Street to the east. Northeastern University is situated approximately 600 ft. north of the site and north of the MBTA/Amtrak corridor and station.

PROPOSED SITE DEVELOPMENT

The proposed commercial development of Parcels 18 and 18B is known as Ruggles Center. The final development as currently proposed consists of a multi-structure mixed-use development comprising three office buildings, a hotel complex, a parking garage, a central public plaza/courtyard, and a playground. Low rise structures between Buildings 1 and 2 and Buildings 3 and 4 are also included in construction plans. It is our understanding that the first phase of development to which this RRIP pertains includes Building 2, the public plaza, and interim surface parking at the future sites of Buildings 1, 3, and 4. Figure 2 indicates areas in the first phase of development, and locations requiring specific remediation as described below.

It is estimated that the first phase of development will require the excavation of approximately 20,800 cu. yds. of urban fill and petroleum contaminated soils. It is anticipated that excavations will not be so deep as to encounter groundwater, however excess precipitation runoff may accumulate in excavated areas.

RECOMMENDED REMEDIAL ALTERNATIVE

The remedial alternative recommended in the FRRP for excavated soils included selected on-site reuse, off-site disposal at a lined landfill, or off-site treatment at an asphalt batching facility, as appropriate. The recommended remedial alternative also included landfill disposal of demolition debris, collection/on-site treatment/discharge of excess precipitation runoff, and dust control during construction.

Additionally, two zones containing high levels of petroleum hydrocarbons, one of which also contains PCBs will require distinct separate actions for removal, isolation, and possibly out of state disposal/treatment.

REMEDIAL RESPONSE IMPLEMENTATION PLAN

The RRIP developed for the recommended remedial alternative includes a list of contacts, disposal site maps, a final design and construction plan. Each element is discussed in the following sections.

A. List of Contacts

As required a list of contacts that includes names, addresses and telephone numbers of persons responsible for and involved in the RRIP is included as Appendix A.

B. Disposal Site Maps

Disposal site maps are provided in this RRIP to illustrate locations of remedial response action activities, existing conditions and proposed conditions.

Figure 2 illustrates locations where remedial response action activities which will be implemented. Activities include excavation for the development of Building No. 2, interim surface parking and the public plaza.

Additional disposal site maps consist of drawings, dated 28 February 1992, which were provided to H&A by Stull and Lee, Inc. (Architects), Boston, Massachusetts. These drawings, are part of the Registry Building, Ruggles Center, Boston, Massachusetts project, and are entitled "Existing Conditions", sheets 1 of 2 (sheet No. C-1) and sheet 2 of 2 (sheet No. C-2) and "Site Grading & Utilities", sheets 1 of 2 (sheet No. C-6) and sheet 2 of 2 (sheet No. C-7).

Sheet No. C-1 and C-2 illustrate existing grades, utilities, structures and roads within the proposed remediation areas. Sheet No. C-6 and C-7 illustrate locations of the proposed Building No. 2 structure, public plaza roadway and interim surface parking. These sheets also show proposed interim surface parking grades and the locations of proposed utilities beneath the plaza and parking areas and for Building No. 2.

Building No. 2 will be constructed on a mat foundation and pressure injected footings (PIFs) within the natural marine



sands. Excavations for PIF cap installation are estimated to range from approximately El. 16 to 11. Excavation for mat construction is estimated to be to approximately El. 11.5. The proposed first floor finish grade is El. 21. Proposed finish grades of the public plaza range from approximately El. 19 to 24.

C. Final Design

The following is a discussion of elements which are part of the remedial response action design:

1. Plans and Specifications

Construction plans and specifications for the first phase of Ruggles Center development have been drafted by the various parties involved. To properly implement the recommended remedial alternative during site development, an Excavated Soil Material Management Plan (ESMMP) Specification has been prepared and is included as Appendix B. The management plan was prepared utilizing guidance provided by Department of Environmental Protection (DEP) Policy No. WSC-400-89 (formerly WSC-89-001), "Management Procedures for Excavated Soils Contaminated with Virgin Petroleum Oils," dated 30 June 1989; and unpublished DEP Memorandum "Northeast Region Standard Practice Document on Petroleum Contaminated Soils," dated 27 December 1990.

The ESSMP is a construction specification document to be used by the owner and earthwork contractors during the first phase of development. The ESMMP includes procedures for on-site storage, soil sampling, chemical testing, on-site re-use and off-site transportation, disposal and treatment of excavated materials.

The ESMMP will be used in conjunction with the Earthwork Specification, which is included in Appendix C. Remedial activities addressed in the ESMMP are integrated into the earthwork specifications in order to implement the RRIP. The Earthwork Specification, provides primarily geotechnical provisions for the earthwork construction, but requires the contractor to comply with soil sampling, testing, segregation and disposal

as outlined in the ESMMP throughout site work activities.

A Health and Safety Plan (H&SP) Specification has also been prepared and is included as Appendix D. The H&S plan is discussed in section 4.

2. Environmental Monitoring Plan

The ESMMP includes procedures for excavated material classification and quality monitoring throughout the completion of the development. Long term monitoring is not anticipated as remedial response will be complete upon completion of site development

3. Preliminary Contingency Plan

The ESMMP includes preliminary contingencies which will be implemented during the development if the presence of potentially hazardous conditions are evident.

4. Preliminary Health and Safety Plan

A H&SP Specification has been prepared and is included as Appendix D. This specification serves as a preliminary H&S plan and outlines provisions that must be met by the Construction Contractor to comply with safety regulations and related issues during the development. In general, this document stipulates requirements regarding the preparation of Health and Safety plans for all workers, a health and safety coordination meeting and training, equipment supply, and equipment decontamination procedures.

5. Preliminary Security Plan

Site security, and control for ESMMP implementation require construction fencing to be installed along the perimeter of work areas to provide security and isolation of excavations and stockpiled materials. It will also be the responsibility of the contractor to provide a security guard service during hours of non construction.

6. Schedule for Implementation

The schedule for implementation of the remedial response alternative is contingent upon the site

construction/development schedule of Ruggles Center. It is understood that commencement of excavation activities is currently projected for late August 1992. Substantial excavations are anticipated to begin by early September. Completion of the first phase of development is anticipated to be by Summer of 1993.

The following is a list of required health and safety and other remedial response actions, with associated implementation schedule dates, relative to the commencement of excavation and completion of the site development for Ruggles Center.

- o Submittal by the Contractor of the name, qualifications and experience of the Site Safety Officer. Required two weeks prior to the commencement date (i.e., initial site mobilization).
- o Submittal by the Contractor of the name, qualifications and experience of the Certified Industrial Hygienist responsible for preparing Contractor's H&SP. Required two weeks prior to the commencement date.
- o Submittal of the Contractor's H&SP to Owner. Required one week prior to the commencement date.
- o Health and safety coordination meeting three days prior to the commencement date.
- o Installation of security fencing and security guard service prior to the commencement date.
- o Construction monitoring by the Engineer from commencement date through completion of soil excavation and final disposition.
- o Contractor retention of transporters for excavated material not less than four weeks before commencement date.
- o Ongoing sampling of excavated material stockpiles and submittal of samples for chemical analysis during site excavations.
- o Conduct sampling of excavated material as placed in stockpiles throughout excavation period.

- o Complete sampling of excavated material stockpiles upon completion of excavation.
- o Complete chemical analysis and categorization of excavated material separated into stockpiles within three weeks of completion of excavation.
- o Submit for Bills of Lading and Uniform Hazardous Waste Manifests, as necessary for off-site removal of excavated material, and complete all submittals within four weeks of completion of excavation.
- o Begin off-site removal of excavated material within three days after approval of Bills of Lading.
- o Completion of off-site disposal within four weeks after approval of final Bills of Lading.

7. Estimated Cost

Significant cost items for the remedial response action include the management and disposal of excavated materials during site development, environmental monitoring services and laboratory chemical testing. The following discusses the estimated costs of such activities.

- o It is anticipated that up to 8,200 cu. yds. of soil will be excavated during construction of Building 2. It is assumed that approximately 2,500 cu. yds of this material could be reused on-site as structural or common fill for construction of Building 2. Of the remaining 5,700 cu. yds of material, it is assumed that 60% would require off-site disposal as Urban Fill at an in-state lined landfill, 30% would require off-site disposal at an in-state asphalt batch plant, and the remaining 10% would be building rubble and require off-site disposal as demolition debris. It is anticipated that up to 160,000 gallons of excess precipitation runoff would be processed through a mobile carbon absorption unit during construction. It is assumed that the water would be collected in a holding tank(s) and processed in batches of 20,000 gallons per day. The estimated costs for disposal of these material include.

On-Site Reuse (\$8/cu.yd)-----	\$20,000
In-State Lined Landfill (\$50/cu.yd)-----	\$171,000
In-State Asphalt Batching (\$105/cu.yd)--	\$179,550
Demolition Debris (\$20/cu.yd)-----	\$11,400
Water Treatment/Disposal	
(3 days @ \$2,000/day)-----	<u>\$16,000</u>
TOTAL:	\$397,950

- o Based on cut and fill calculations performed by the Halvorson Company, Inc. (landscape architects and site planning consultants for the project), H&A estimates that approximately 1,600 cu. yds. of soil will be excavated beneath the existing roadway material for the Public Plaza. This estimate includes excavations for the proposed subgrades and utilities.

An estimated 2,800 cu. yds. of existing roadway material will also require excavation. It is our understanding that the Contractor intends to process this material on-site and re-use it as a reclaimed pavement material for sub-base/base coarse material in the public plaza roadways and in the interim parking area.

Of the estimated 1,600 cu. yds. of excavated soil, it is assumed that none of this material would be reused on-site due to the limited amount of backfill required. It is assumed that 80% would require off-site disposal as Urban Fill at an in-state lined landfill, 10% would require off-site disposal at an in-state asphalt batch plant, and the remaining 10% would require off-site disposal as demolition debris. The estimated costs for disposal of this material include.

In-State Lined Landfill (\$50/cu.yd)-----	\$ 64,000
In-State Asphalt Batching (\$105/cu.yd)--	\$ 16,800
Demolition Debris (\$20/cu.yd)-----	<u>\$ 3,200</u>
TOTAL:	\$ 84,000

- o It is anticipated that up to 11,000 cu. yds. of soil will be excavated during construction of the interim parking areas. It is assumed that none of this material would be reused on-site due to the limited amount of backfill required. It is assumed that 80% would require off-site disposal as Urban Fill at an in-state lined landfill, 10% would require off-site disposal at an in-state asphalt batch plant, and the

remaining 10% would require off-site disposal as demolition debris. The estimated costs for disposal of this material include.

In-State Lined Landfill (\$50/cu.yd)-----	\$440,000
In-State Asphalt Batching (\$105/cu.yd)-----	\$115,500
Demolition Debris (\$20/cu.yd)-----	<u>\$ 22,000</u>
TOTAL:	\$577,500

- o Environmental monitoring activities relative to the ESMP and H&SP Specification will require full-time services during the excavation and disposition of soil to document compliance with specifications. Monitoring activities will also include data submittal and coordination with DEP for Bills of Lading, laboratory chemical testing and preparation of a MCP-Final Inspection Report. Cost of these environmental services are estimated to be approximately \$263,600.

The following is a summary of estimated remediation related costs of site development.

o Building 2 -----	\$397,950
o Public Plaza-----	\$ 84,000
o Interim Parking -----	\$577,500
o Environmental Services-----	<u>\$263,600</u>
TOTAL:	\$1,323,050

D. Construction Plan

The remedial response construction schedule and implementation plan for monitoring during site development is contingent upon the site construction/development schedule. The schedule for implementation and environmental monitoring services will be modified accordingly to meet accelerations or delays in the site construction/development schedule.

The contractors H&SP in conjunction with the H&SP Specification will be implemented as the final health and safety plan. The owner's environmental representative will attend the contractor's health and safety coordination meeting prior to commencement of excavation work at the site. The representative will review and comment on the contractor H&SP. Field work will be conducted in accordance with the plan, and the plan will be modified during the project if warranted, as information on site conditions is gained.

The owner's environmental representative referred to as the Engineer in the ESMMP will monitor the Contractor implementation of remedial activities. The Engineer will conduct soil quality monitoring, soil/excavation material classification for on-site stockpiling and re-use, and collect soil samples for laboratory chemical testing to characterize the soil for off-site disposal or treatment.

The Engineer will maintain daily field reports and collect other pertinent information during the remedial activities which will be used to prepare the data submittal for soil disposal to the DEP.

The preliminary site security plan and contingency plan will be implemented as part of the final design plans. These elements will be modified during the project if necessary, as site situations change and information on site conditions is obtained.

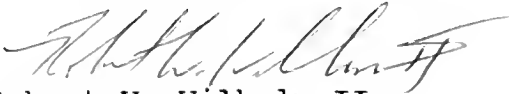
E. Initial Operation and Maintenance Plan

There is no specific initial operation and maintenance plan. Elements of the initial operation and maintenance have been integrated into the ESMMP. These include identification of monitoring equipment necessary, and type, frequency, and duration of testing and monitoring. Quality assurance and quality control are also integrated into the ESMMP document. Modification of remedial response action activities will be implemented if necessary, as site situations change and information on site conditions is obtained.

F.R. Harris, Inc.
11 August 1992
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Please do not hesitate to contact us should you have any questions concerning this RRIP. It has been a pleasure to be of service to you.

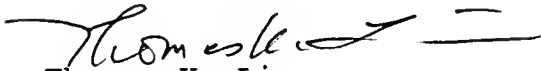
Sincerely yours,
HALEY & ALDRICH, INC.



Robert W. Wilhelm II
Senior Hydrogeologist



Deborah H. Gevalt
Vice President
(Technical Reviewer)



Thomas K. Liu
Chairman

MZZ:RWW:DHG:TKL:aw/MMZ001D.RUGGPHA4.wpf

Enclosures:

- Figure 1 - Project Locus
- Figure 2 - Site Plan
- Appendix A - List of Contacts
- Appendix B - Excavated Soil Material Management Plan
Specification
- Appendix C - Earthwork Specification
- Appendix D - Health and Safety Specification

Figures



SITE COORDINATES: 42°20'08"N 71°05'21"W



Haley & Aldrich, Inc.
Consulting Geotechnical Engineers, Geologists and Hydrogeologists

PARCEL 18 AND 18B
BOSTON, MASSACHUSETTS

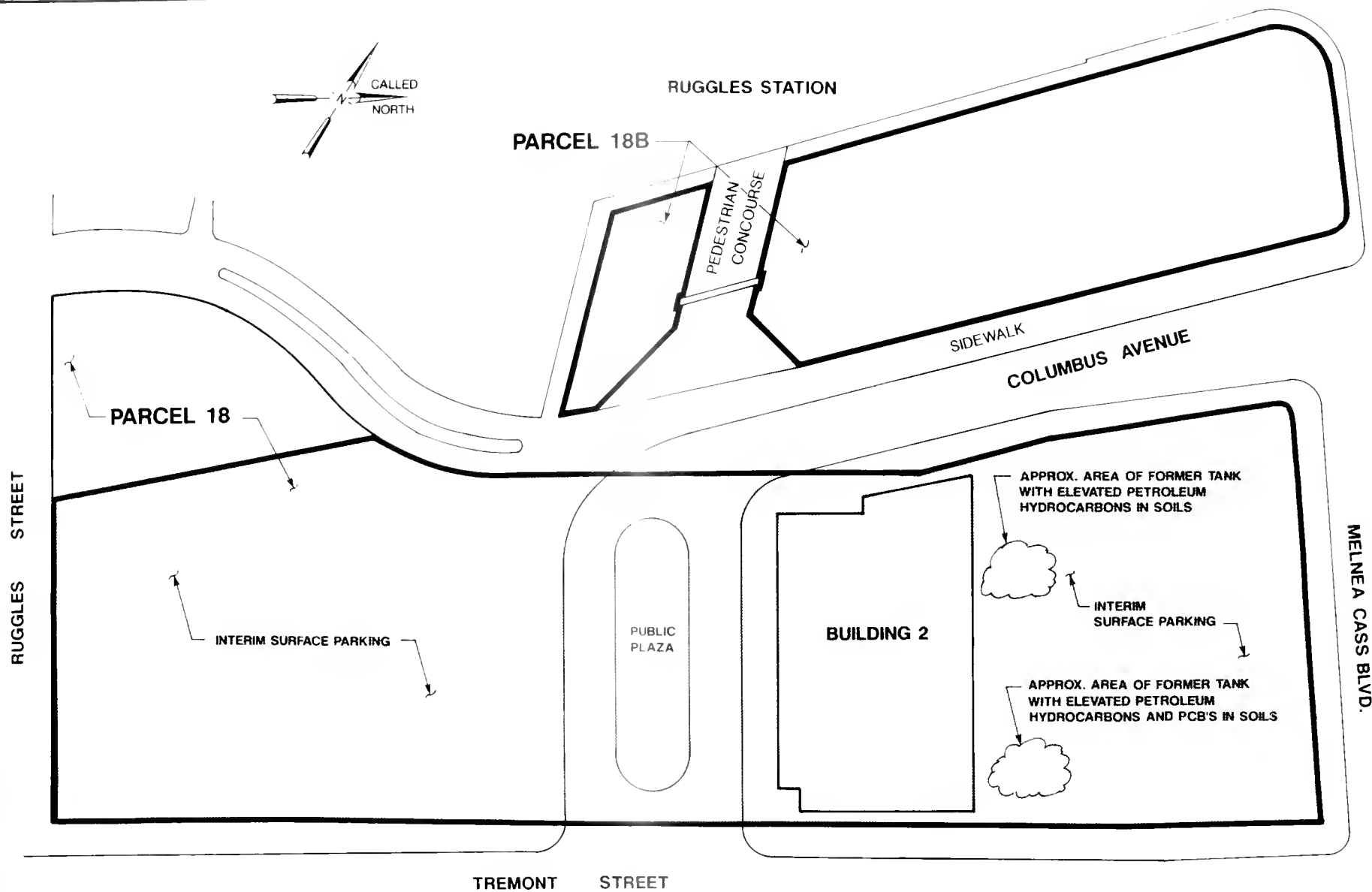
PROJECT LOCUS

U.S.G.S. QUADRANGLE: BOSTON SOUTH, MA


APPROX. SCALE 1:25,000

APRIL 1989

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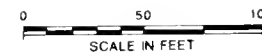


LEGEND:

-  AREA IN WHICH REMEDIAL RESPONSE ACTION ACTIVITIES WILL BE CONDUCTED

NOTE:

- 1. EXISTING SITE CONDITIONS ARE NOT SHOWN. SITE DEVELOPMENT FOR BUILDING 2 CONSTRUCTION IS INDICATED.



AOA Haley & Aldrich, Inc.
Consulting Geotechnical Engineers, Geologists and Hydrogeologists

PHASE IV: REMEDIAL RESPONSE IMPLEMENTATION PLAN
RUGGLES CENTER - BUILDING 2
BOSTON, MASSACHUSETTS

SITE PLAN

SCALE AS SHOWN

JULY 1992

SL

STULL AND LEE, INC. ARCHITECTS
38 CHAUNCEY STREET SUITE 1100
BOSTON, MA. 02111 (617)426-0406

DES. BY:

DWN. BY:

CHK. BY:

APPR. BY:

DATE:

GENERAL NOTES:

18-2

CHARTER

1000 TAIL

Appendix A

APPENDIX A
List of Contacts

APPENDIX A

LIST OF CONTACTS

REMEDIAL RESPONSE IMPLEMENTATION PLAN RUGGLES CENTER - BUILDING 2 BOSTON, MASSACHUSETTS

1. Robert W. Wilhelm II
Haley & Aldrich, Inc.
Geotechnical Engineers & Environmental Consultants
58 Charles Street
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(617) 494-1606
2. Tom Beddall
Stull and Lee, Inc.
Architects and Planners
38 Chauncy Street
Suite 1100
Boston, Massachusetts 02111
(617) 426-0406
3. Randy Long
Metropolitan/Columbia Plaza Venture
Commercial Developer (Owner)
125 Summer Street
Suite 1400
Boston, Massachusetts 02110
4. Jane A. Chmielinski
MBTA
Ten Park Plaza
Boston, Massachusetts 02116
(617) 722-5022
5. Joseph Brown
Beacon Construction Company
Contractor
3 Center Plaza
Boston, Massachusetts 02108
(617) 742-8800

Appendix B



APPENDIX B

Excavated Soil Material Management Plan

SECTION 02220

EXCAVATED SOIL MATERIAL MANAGEMENT PLAN

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

- A. The provisions specified in this section may be subject to alterations based on actual field conditions encountered during excavation activities and subsequent requirements from the DEP. The DEP "reserves the right to impose additional requirements and to change them (requirements) at any time" as per DEP Policy #WSC-89-001 "Management Procedures for Excavated Soils contaminated with Virgin Petroleum Oil, dated 30 June 1989.
- B. Materials encountered in the excavation shall be handled in a manner which complies with applicable federal, state and local laws and regulations and with the procedures described in these Specifications.
- C. It is planned to reuse suitable excavated material on-site. The Contractor shall refer to Specification Section 02200 - Earthwork for material criteria as well as backfill use and placement requirements.
- D. The Owner will provide on-site monitoring of excavated materials to determine the requirements for stockpiling, handling, and testing of the excavated material for the purpose of determining its suitability for on-site reuse or disposition for off-site disposal/treatment.
- E. The Contractor shall store excavated material in designated stockpile or impoundment areas as described herein. The Contractor shall not remove any excavated materials from the site for disposal or treatment without a DEP approved Bill of Lading or manifest.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 02100: Site Preparation
- B. Section 02350: Pressure Injected Footings
- C. Section 02200: Earthwork

D. Section 02210: Health and Safety

1.03 DEFINITIONS AND REFERENCE DOCUMENTS

- A. UST: Underground Storage Tank
- B. TPH: Total Petroleum Hydrocarbons (EPA 418.1 or GC/FID)
- C. VOC Headspace Screening: Total Volatile Organic Compounds expressed as benzene measured in the air above a sample in a sealed partially filled container.
- D. DEP: Massachusetts Department of Environmental Protection.
- E. Virgin Petroleum Oils: "Unused distillate and residual petroleum oils, including, but not limited to, gasoline, aviation fuels, kerosene, diesel, and number 2, 4 and 6 heating oils. These petroleum oils are subdivided into two groups for the purposes of measurement. Oils are measured as total petroleum hydrocarbons (TPH). Volatiles are measured as total organic headspace vapors with a photoionization detector (PID), expressed as parts per million (ppm) of benzene. The volatiles group includes gasoline and the oil residuals group includes kerosene, aviation fuels, diesel and the heating oils" as defined by DEP Policy #WSC-89-001.
- F. Urban Fill (A. K. A. "Downtown Brown"): "Soils excavated in urbanized areas often contain low to moderate concentrations of petroleum hydrocarbons and other common industrial contaminants that cannot be directly attributed to a point-source release (i.e. leaking tanks). Contamination of this nature is primarily due to past site utilization (i.e. years of small spills/drips), the presence of artificial fills of unknown origins, and historical area-wide deposition of automobile/smokestack emissions" as defined by unpublished DEP Memorandum, dated 27 December 1990, entitled "NERO Standard Practice Document on Petroleum Soils".
- G. De Minimis: Concentration of common industrial contaminants in "virgin and non-virgin petroleum contaminated soils where their presence is incidental to the petroleum contamination and cannot be attributed to any known point-source" as defined by unpublished DEP Memorandum, dated 27 December 1990, entitled "NERO Standard Practice Documentation on Petroleum Soils".

- H. DEP Policy #WSC-89-001 entitled "Management Procedures for Excavated Soils Contaminated with Virgin Petroleum Oils", dated 30 June 1989.
- I. Unpublished DEP Memorandum entitled "NERO Standard Practice Document on Petroleum Contaminated Soils", dated 27 December 1990.
- J. PID - Photoionization Detector calibrated to benzene standard, used to field screen soils for the presence of volatile organic compounds.
- K. Geotechnical/Environmental Engineer: The Geotechnical/Environmental Engineer is the firm of Haley & Aldrich, Inc. The Geotechnical/Environmental Engineer or his authorized representative is the authorized representative of the Owner for the work covered by this section and is hereinafter referred to as the Engineer.

PART 2 - PRODUCTS

6 mil polyethylene sheeting

20 mil polyethylene sheeting

PART 3 - EXECUTION

3.01 EXCAVATION

- A. The potential exists for encountering contaminated material during excavation. The contractor shall excavate material by methods which will permit observation of exposed subsurface soils to reduce the potential for mixing visually contaminated soils with visually uncontaminated soils.
- B. The Contractor shall excavate beyond the limits of the excavation, only when directed, to remove localized areas of stained soil which indicate visual, olfactory or field screening evidence of contamination.

3.02 EXCAVATED MATERIAL CLASSIFICATION FOR ON-SITE REUSE AND STOCKPILING

- A. Excavated material will ultimately be classified into six main groups and stockpiled separately. Classification will be based on the results of the Engineer's field observations and PID screening during excavation and subsequent field or laboratory analytical testing for total petroleum hydrocarbons (TPH), if necessary. Group I and II materials are considered suitable for on-site reuse. Groups III, IV and V materials are not suitable for on-site reuse. Group VI materials generally consist of demolition and construction debris. Analytical testing will be performed on soils that indicate visual or olfactory evidence of contamination or soils that indicate PID readings greater than 1 ppm.

Material Suitable for Unrestricted Reuse

- o Group I: Soils which do not indicate visual or olfactory evidence of contamination and where field screening indicates background PID readings (i.e. <1 ppm above background). Visually uncontaminated soils which meet this screening criteria will not be analytically tested prior to on-site reuse. Soils which are visually contaminated and contain < 100 ppm TPH will be suitable for on-site reuse.

Material Suitable for Restricted Reuse Based on Chemical Testing Results:

- o Group II: Soils which indicate visual or olfactory evidence of contamination (light staining) where TPH concentrations are below 300 ppm and where field screening indicates PID readings less than 10 ppm.

Material Not Suitable for On-Site Reuse:

- o Group III: Soils which indicate visual or olfactory evidence of contamination (moderate staining) where TPH concentrations exceed the levels allowable for on-site reuse as backfill or soils which exhibit PID readings greater than 10 ppm and less than 100 ppm.
- o Group IV: Soils which indicate visual or olfactory evidence of contamination (heavy staining) where TPH concentrations would classify the material as a

Hazardous Material or soils which exhibit PID readings greater than or equal to 100 ppm.

- o Group V: Excavated soils which indicate visual or olfactory evidence of contamination (heavy staining) and are known or suspected to originate from a point source of Waste Oil where TPH and/or PCB concentrations would classify the material as a Hazardous Waste.
- o Group VI: Solid waste from buried foundation remnants or other structures such as granite blocks, bricks and other demolition or construction debris.

- B. The criteria for classification and stockpiling of Groups I through IV are shown graphically in Table I.
- C. Group I and II stockpile materials not reused on-site and Group III, IV and V stockpiles will be sampled and analytically tested to determine disposition for off-site treatment or disposal. (See paragraph 3-07 herein).

3.03 SOIL QUALITY MONITORING

- A. Visual and Olfactory Criteria: Excavated soils will be monitored by the Engineer for visual and olfactory evidence of contamination, including discoloration, texture, odor, etc.
 - o If material does not indicate evidence of oil staining, does not exhibit discoloration or unnatural odor the soil will be classified as Group I soils and stockpiled on-site for reuse as backfill material.
 - o If material has light staining, has a slight petroleum or other odor or has other indications of contamination, the excavated material will be stockpiled at an intermediate location and field screened for TPH using a portable laboratory analyzer or sent to a laboratory for analytical testing. Material will be classified into Group II or III based on the TPH test results and moved from the intermediate stockpile to the appropriate Group stockpile.
 - o If material has moderate staining and odor, is discolored or has other indications of contamination the material will be classified as Group III soils and

stockpiled for sampling and analytical testing to determine its disposition for off-site disposal or treatment (See paragraph 3-07 herein).

- o If material exhibits heavy staining, is unusually discolored, has a strong odor or contains unidentified waste indicating evidence of contamination which may be hazardous, the material will be classified as Group IV soils and stockpiled for sampling and analytical testing to determine its disposition for off-site disposal or treatment (See paragraph 3-07 herein).
- o If material exhibits heavy staining, is unusually discolored, has a strong odor or contains unidentified waste indicating evidence of contamination which may be hazardous and is known or suspected of originating from a point source (i.e.: leaking UST), the material will be classified as Group V soils and stockpiled for sampling and analytical testing to determine its disposition for off-site disposal or treatment (See paragraph 3-07 herein).

B. PID Screening Criteria: In conjunction with visual and olfactory monitoring, excavated material will be screened with a (PID) to determine the relative concentration of volatile organic compounds (VOCs). Screening will occur in the excavation area (ambient conditions) and will include periodic screening of soil samples using jar headspace techniques (approximately 1 sample every 20 to 50 cu. yd. pending visual and olfactory observation). Ambient PID readings will be collected in the work zone and within 6 inches of the excavated material. Material will be classified based on PID readings as follows:

- o Group I - background levels (i.e. < 1 ppm above background)
- o Group II - less than 10 ppm
- o Group III - 10 to 100 ppm
- o Group IV - greater than 100 ppm
- o Group V - greater than 100 ppm

C. Materials classified as Group VI (solid waste) shall be stockpiled separately from other materials and will not be subject to analytical testing to determine disposition of the soil for off-site disposal. If indications of contamination are apparent during excavation of solid

waste material, segregation of solid waste from contaminated soil will be necessary.

3.04 HEALTH AND SAFETY/RIGHT-TO-KNOW

- A. All contractors are required to notify their workers of the history of the site and contaminants that may be present, and to be alert for evidence of contaminated soils. The Engineer (Haley & Aldrich, Inc.) should be notified of the presence of potentially hazardous conditions, if encountered.
- B. All contractors will be required to prepare a Health and Safety Plan for their workers at the site. It will be necessary that workers who are in close proximity to excavated materials be trained in Health and Safety procedures according to the OSHA requirements and be current in their OSHA refresher course.

3.05 SOIL/EXCAVATED MATERIAL STOCKPILING

- A. Excavated material classified as Group I material according to the visual, olfactory and PID screening criteria may be moved directly into the construction area for reuse as backfill or stockpiled.
- B. Excavated material classified as Group II material according to the visual, olfactory and PID screening criteria will be temporarily stockpiled in intermediate areas for subsequent chemical testing. The stockpile shall be located away from the on-going construction activity, pending the results of the on-site or laboratory analyses. Once the material is classified into a Group II, III or IV based on the results of the chemical testing it may be moved directly into the construction area if suitable for reuse (Group II) or temporarily stockpiled into "Group" stockpiles. Soils from the intermediate piles with TPH levels less than 300 mg/kg will be placed in Group II stockpiles. Soils with TPH levels less than 100 mg/kg will be placed in Group I stockpiles.
- C. Intermediate or "Group" stockpiles of visually contaminated material (Groups II, III) should be placed on 6 mil polyethylene plastic and securely covered with 6 mil polyethylene.

- D. Group IV and V material shall be stored in a separate impoundment area within a perimeter of concrete "Jersey" barriers, lined with 20-mil polyethylene and securely covered with 20-mil polyethylene. This area shall be secured with a fence and identified as a "restricted area" to prevent contact with the material.
- E. Group VI material, solid waste, shall be stockpiled separately for processing and on-site reuse or off-site disposal.
- F. All Group stockpiles shall be shaped and graded to facilitate surface drainage. The Contractor shall take appropriate measures to prevent dust and leaching from all Group stockpiles.
- G. All stockpiling will be performed on-site within the security of construction fencing. Stockpiling in the location of Parcel 18B shall not be permitted.

3.06 USE OF GROUP I AND II MATERIAL

- A. Not all material meeting the environmental criteria for classification as Group I or II material will be suitable for reuse on-site. The use of Group I and II material is also dependent on the geotechnical classification of the soil as follows:
 - o Group I soil which conforms to the requirements of "common fill" in Specification Section 02200 - Earthwork is suitable for reuse inside or outside the building limits, where common fill is specified.
 - o Group II soil which does conform to the requirements of "common fill" in Specification Section 02200-Earthwork is suitable to use in areas outside the building (exterior of the perimeter grade beams) where common fill is specified. Group II soils shall be covered with a minimum of 12 inches of Group I material or clean off-site material conforming to Group I criteria.
 - o In anticipation of Group I shortages, use of Group I soils will be restricted to inside the building unless approved by the Engineer. If shortage of Group I soils exist, the Engineer may also approve the use of Group II soils inside the building.

- B. Excavated material is anticipated to contain various amounts of unsuitable material such as building debris, wood, concrete etc. The Contractor shall be prepared to mobilize equipment necessary to remove this material from the soil (mechanical screening). Much of this screened material may be classified as a Group VI material. The contractor may elect to process (crush) the screened material or solid waste such as concrete and granite blocks for on-site reuse. The suitability of the processed material for reuse will be determined by the Engineer.

3.07 DISPOSITION OF EXCESS MATERIAL FOR OFF-SITE DISPOSAL OR TREATMENT

- A. Options for off-site disposal or treatment of contaminated soils will be determined during construction based on the chemical testing results and discussions with DEP Solid/Hazardous Waste. However, options have been narrowed to disposal of regulated material to an in-state landfill, treatment of material at an in-state asphalt batching facility and disposal of hazardous waste at an out-of-state landfill or treatment facility.
- B. The Contractor shall be responsible for proper disposal of materials leaving the site in accordance with applicable Federal, State and Local laws.
- C. Group I and II stockpiles not reused on-site and Group III, IV and V stockpiles will be subject to DEP approval or off-site disposal which will require chemical testing (performed by the Owner) to characterize the material prior to leaving the site. The criteria for classification of excavated soil for off-site disposal/treatment are illustrated in Table II. Table III lists the chemical testing criteria established by the DEP and most disposal facilities that would be required to evaluate off-site disposal or treatment requirements.
- D. Primary testing consists of TPH analysis which will be conducted on-site with a portable infrared analyzer or at an off-site laboratory (EPA Method 418.1). Refer to Table II for minimum frequency of sampling for all Groups.
- E. Secondary testing for Group I, II and III will include VOCs (EPA Method 8240), Hydrocarbon Fingerprinting by GC/FID (Modified ASTM Method D3328). Total RCRA 8 Metals (EPA 6010/7000 Series), TCLP RCRA 8 Metals plus Copper,

Nickel, Zinc (only where total metals exceed 500 ppm lead and 20 x TCLP criteria for other metals), TCLP for Pesticides, PCBs (EPA Method 8080), PAHs/Extractables (EPA Method 8250, 8270), pH/Corrosivity (EPA Method 5.2), Flash Point (ASTM D-93-79/80 or D-3278-78) and Reactivity: Sulfide (EPA Method 9010) and Cyanide (EPA Method 9030).

The minimum frequency of sampling and testing for Group I, II and III will be 1000 cu. yds.

- F. Secondary testing for Group IV and V will include VOCs (EPA Method 8240), Hydrocarbon Fingerprinting by GC/FID (Modified ASTM Method D3328), Semi-volatiles (EPA Method 8270), Total RCRA 8 Metals (EPA 6010/7000 Series), TCLP RCRA 8 Metals, TCLP for Pesticides, PCBs (EPA Method 8080), pH/Corrosivity (EPA Method 5.2), Flash Point (ASTM D-93-79/80 or D-3278-78), Reactivity: Sulfide (EPA Method 9010) and Cyanide (EPA Method 9030), Total Cyanide (EPA 9010), Paint Filter Test, and Sieve. The minimum frequency of sampling and testing for Group IV and V will be 500 cu. yds.
- G. Based on the chemical testing, soil will be classified into the following types for purposes of off-site disposal or treatment according to criteria established by the DEP as outlined in Table II attached.

1. Regulated Soil Disposed at In-State Lined Landfills

Excavated soil contaminated with virgin petroleum oil or an urban fill. Material does not exceed maximum concentrations of TCLP for pesticide contaminants, VOCs and RCRA 8 metals and conforms to the following criteria:

- o Does not exceed De Minimus levels listed in Table III.
- o TPH levels less than 1000 mg/kg.
- o PID headspace analysis levels less than 100 ppm.

Note: Generally, if excavated material is to be considered for reuse as daily cover at an in-state landfill it must meet the following criteria:

- o The material must be free from demolition materials, refuse and other debris.

- o The material must have suitable physical properties consistent with Division of Solid Waste Management (DSWM) regulation 310 CMR 19.130 (15) and applicable policies.
- o The material must have TPH levels less than 1000 mg/kg and PID headspace analysis less than 100 ppm.

Note: The categories of excavated materials appropriate for in-state disposal at a lined landfill apply only to landfills within the DEP Northeast Region. Use of landfills outside the Northeast Region will require the approval of the appropriate regional office. Excavated soils may also be subjected to requirements from individual landfills. Requirements may include removal of debris from excavated soils and confirmatory testing after placement at the landfill.

2. Material Disposed at In-State Asphalt Batching Treatment Facility

- a. Excavated soil contaminated with virgin petroleum oil or an urban fill not originating from a point source waste oil or hazardous material. Material which exceed threshold limiting criteria listed in Table III but does not exceed Maximum Concentrations of TCLP for pesticide contaminants, VOCs or RCRA 8 metals. Material exceeds any of the following:
 - o De Minimus levels listed in Table III.
 - o TPH levels of 1000 mg/kg
 - o PID headspace analysis levels greater than 100 ppm.

Note: The categories of excavated soils appropriate for an in-state treatment facility may apply only to facilities in the DEP Northeast Region. Use of treatment facilities outside the Northeast Region will require approval of the appropriate region office. Excavated soils may be subjected to additional testing requirements from individual treatment facilities.

3. Hazardous Waste Disposed at Out-of-State Disposal or Treatment Facility

- a. Excavated soil exceeding Maximum Concentration of TCLP for pesticide contaminants, VOCs or RCRA 8 metals.
- b. Excavated soil (non virgin petroleum contamination) originating from a point source waste oil or hazardous material that does not meet permitting requirements of in-state treatment facilities.

3.08 TRANSPORTATION OF EXCAVATED MATERIAL

- A. Materials removed from the site shall be loaded onto trucks within the site limits. All trucks leaving the site shall be covered and cleaned of spilled debris that might fall from the trucks during transport. Every attempt will be made to prevent debris from being spilled from trucks or tracked from the site onto local streets. Each work day the contractor will clean local streets which contain site debris.
- B. All material removed from the site is subject to documentation requirements stating destination and quantity and authorization from DEP. Bills of Lading issued by the DEP will be necessary for off-site disposal. DEP may allow common carriers to ship excavated soils within state destinations. EPA Uniform Hazardous Waste Manifests will be necessary for out-of-state disposal. Licensed Hazardous Waste transporter will be required for excavated soils with out-of-state destinations.

3.09 DEWATERING/SEDIMENTATION CONTROL

- A. Groundwater is not expected to be encountered during foundation construction. However, surface water from rainfall and runoff of drill water from pile pre-augering may collect in the pile cap excavations and require pumping for construction in-the-dry. The collected water will require sedimentation control devices and storage in an on-site holding tank prior to testing and treatment or discharge to the nearby sewer/storm drainage system. The sedimentation control system will require the use of two settlement basins connected by pipes to remove fines prior to discharge. The Contractor shall design the

sedimentation control system in accordance with the criteria given in the permit submittal prepared by the Geotechnical Engineer on behalf of the Owner and install it according to the submitted shop drawings.

- B. Water collected in the holding tank will be subject to chemical testing prior to treatment or discharge. The Contractor shall not discharge the water in the storm drains without reviewing the chemical testing results to determine compliance with discharge limitations given in the permits.
- C. The Owner will submit documentation to the MWRA and to the City of Boston necessary to obtain the permits required for discharge into the sewer/storm drains. The Contractor shall be responsible for compliance with the conditions stated in the permits. Chemical testing performed by the owner does not release the Contractor from this responsibility.

3.10 DUST CONTROL

- A. The Contractor shall employ dust control measures to minimize the creation of airborne dust during the entire construction process. As a minimum, standard dust control techniques shall be employed where heavy equipment will be traveling such as watering-down the site or spreading hygroscopic salts.

3.11 CONTINGENCIES

- A. If during the work, the presence of potentially hazardous conditions is evident, work in the area shall be suspended. These conditions include, but are not limited to, encountering buried containers, drums, USTs or soil potentially categorized as Group V material.
- B. The area will be secured to prevent the existence of a health risk or release into the environment. The sources of the event causing the material to be considered suspect will be evaluated by the Engineer prior to resuming of the work. In the event that buried containers, drums or tanks are encountered or if a release of oil or potentially hazardous materials has occurred, the Contractor shall notify DEP Incident Response. The City of Boston Fire Department and state Fire Marshal's office must be

notified and permits secured prior to removal of buried storage tanks.

- C. The impact on the work should be evaluated with respect to the disposal options for the material, on site handling procedures, and the site health and safety program. If necessary, procedures will be developed to allow the work in the area to continue in a monitored environment within the guidelines of a health and safety program.

END OF SECTION

MMZ001D:RUGESMMP.wpf

RUGGLES CENTER - BUILDING 2
ESMMP/02220-14
REVISED 11 AUGUST 1992
6/11/1992

TABLE I
EXCAVATED MATERIAL CLASSIFICATION FOR ON-SITE REUSE

RUGGLES CENTER
BOSTON, MASSACHUSETTS

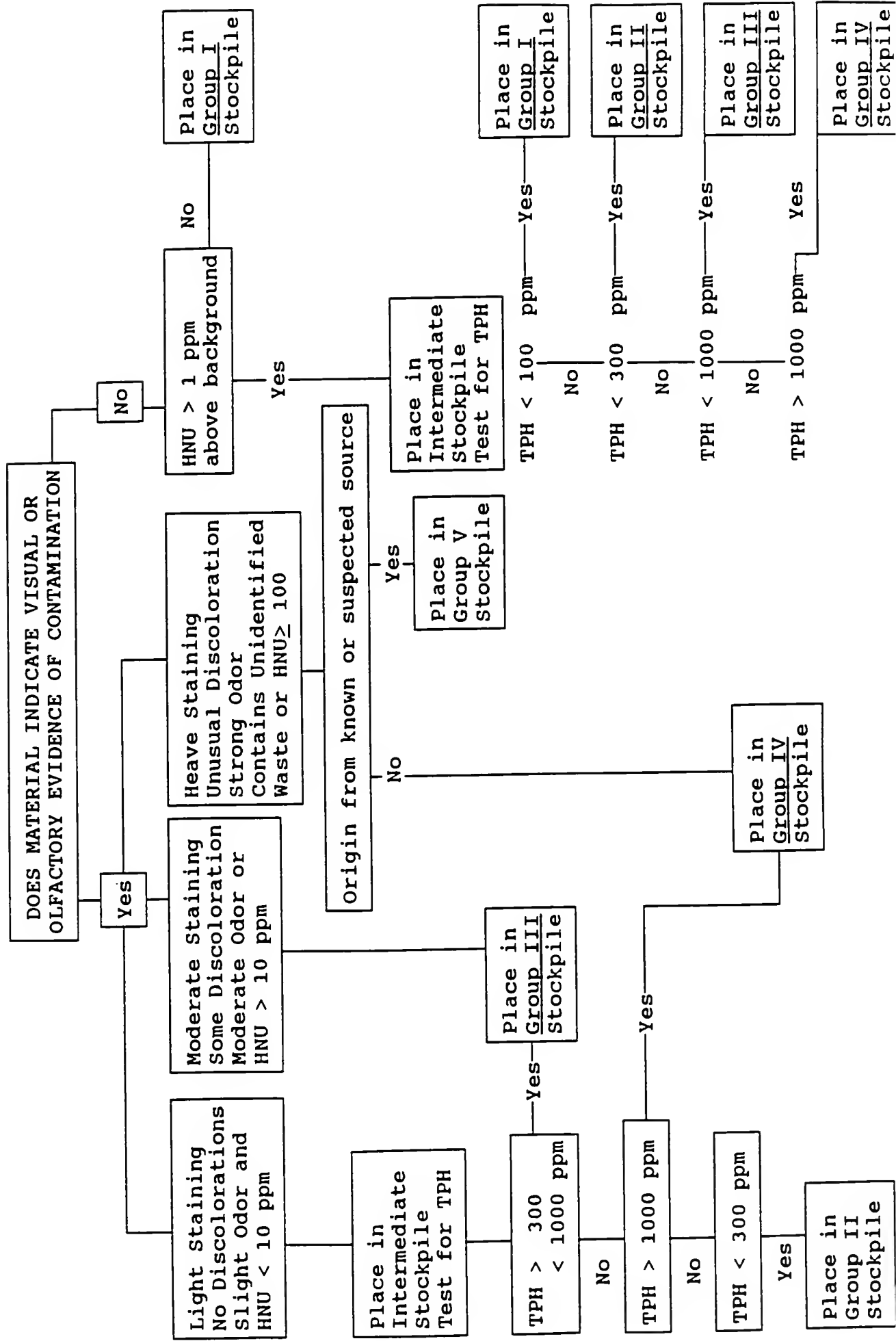


Table II

EXCAVATED SOIL CLASSIFICATION FOR OFF-SITE DISPOSAL/TREATMENT

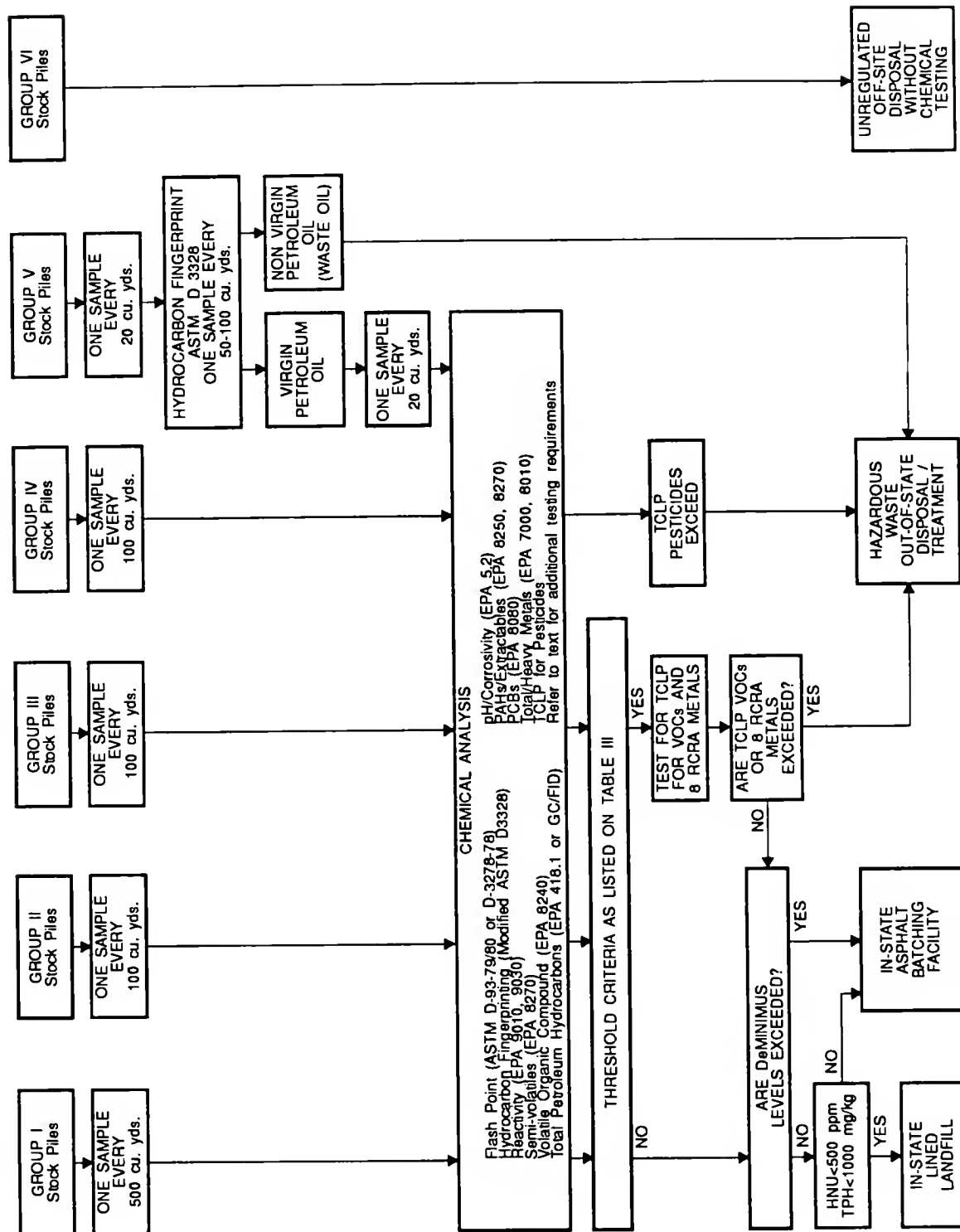
Ruggles Center
Boston, Massachusetts

Table III
ESMMP OFF-SITE SOIL DISPOSAL CRITERIA
RUGGLES CENTER
BOSTON, MASSACHUSETTS

THRESHOLD CRITERIA FOR TCLP TESTING

<u>Parameters</u>	<u>Allowable Levels (mg/kg)</u>
<u>Total Metals (EPA 7000/ 6010 Series)</u>	
Arsenic	100
Cadmium	20
Chromium	100
Lead	500
Mercury	4
Selenium	20
Silver	100
<u>VOCs (EPA 8240)</u>	
Benzene	10
Carbon Tetrachloride	10
Chlorobenzene	2000
1,4-Dichlorobenzene	150
1,2-Dichloroethane	10
1,1-Dichloroethylene	14
Tetrachloroethylene	14
Trichloroethylene	10

Table III
(Continued)

ESMMP OFF-SITE SOIL DISPOSAL CRITERIA

RUGGLES CENTER
BOSTON, MASSACHUSETTS

DE MINIMUS LEVELS FOR LANDFILLING

<u>Parameters</u>	<u>Allowable Levels (mg/kg)</u>
Total Non-Petroleum Halogenated VOCs	4
Total PAHs	100
Total PCBs	10
Arsenic	40
Cadmium	5
Chromium	100
Mercury	2
Lead	1000

Appendix C

APPENDIX C

Earthwork Specification

SECTION 02200
EARTHWORK

PART 1 - GENERAL

1.01 REFERENCES

- A. General provisions of the Contract, including General and Supplementary Conditions and Division 1, General Requirements, apply to work specified in this Section.
1. Examine all other sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
 2. Coordinate work with that of all other trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under Contract.
- B. Definitions and Reference Standards
1. Owner: The Owner is Metropolitan/Columbia Plaza Venture.
 2. Architect: The Architect is the firm of Stull & Lee.
 3. Structural Engineer: The Structural Engineer is the firm of Weidlinger Associates.
 4. Geotechnical Engineer/Environmental Engineer: The Geotechnical/Environmental Engineer is the firm of Haley & Aldrich, Inc. The Geotechnical/Environmental Engineer or his authorized representative is the authorized representative of the Owner for the work covered by this section and is hereinafter referred to as the Engineer.
 5. Contractor: The Contractor is Beacon Construction Company. The Contractor is responsible for the work under this Section. The term Contractor shall also refer to an authorized representative of the Contractor.
 6. Subcontractor: The Subcontractor is the person or organization engaged by the Contractor to perform the work under this section.

7. ASTM: Specifications of the American Society for Testing and Materials.
8. AASHTO: American Association of State Highway and Transportation Officials.
9. ACI: American Concrete Institute.
10. Code: Current Massachusetts State Building Code.
11. EPA: Environmental Protection Agency.
12. DEP: Massachusetts Department of Environmental Protection.
13. Subgrade: The required surface of subsoil, borrow fill or compacted fill immediately beneath site improvements, foundations, specially dimensioned fill, paving, topsoil or other surfacing material or as otherwise designated on the drawings.
14. ESMMP: Excavated Soil Material Management Plan prepared specifically for this site which outlines procedures to be used as a guideline for on-site classification, handling, testing, and disposal of excavated soil material during construction.
15. Health and Safety Plan: The Health and Safety Plan, prepared specifically for work at this site, identifies the potential risks to which workers may be exposed when conducting work at the site as required by OSHA and outlines action plans for personal protective clothing and monitoring of contaminated material.
16. MDPW: Massachusetts Department of Public Works.
17. PIF: Pressure Injected Footing.

1.02 WORK INCLUDED IN THIS SECTION: The work covered by this Section, without limiting the generality thereof, consists of furnishing all plant, labor, equipment, appliances and material and performing all operations in connection with excavation, filling and grading, to the lines and grades shown on the drawings and as specified herein. As a minimum, the work shall include the following:

1. Protection of all roads, sidewalks and existing utilities to remain.

2. Excavation to indicated subgrade levels as approved by the Engineer for all pile caps, foundations, utility lines, slabs and pavements, and other improvements.
3. Excavating all types of materials to limits indicated or required, including soil, utilities, existing building foundations, pavements, curbs and other materials and obstructions for new below-grade construction, and other site improvements indicated on the Drawings.
4. Removal of obstructions and other existing buried structures where they interfere with the installation of new piles or other foundation elements.
5. Special handling, on-site stockpiling and/or legal disposal of excavated materials as specified.
6. Reuse of on-site excavated material as Common Fill. Reuse of any excavated fill shall be in accordance with ESMMP and shall require approval by the Engineer prior to placement. Mechanical screening of excavated material may be required prior to use.
7. Where reuse of excavated materials on site is not approved by the Engineer or of sufficient quantity, furnishing from an approved borrow source, specified earth materials for placement and compaction on site as required to complete the work of this section. This shall include fill to raise site grades or backfill for walls, around and beneath foundation elements and utilities, beneath slabs, pavements or other site improvement features.
8. Dewatering as required to conduct all work in-the-dry.
9. Proof rolling subgrades in building, parking and roadway areas.
10. Backfilling and compaction operations associated with Granular Fill, and Common Fill placement; slab construction; utility relocation work and new utility construction; sidewalk and pavement reconstruction; and other areas where backfill is required for project construction.
11. Grading, shaping and compacting excavation subgrades, backfills, and original ground upon which pavement, surfacing, base, subbase or structures are to be placed.

12. Removal of buried tanks, if encountered, will be performed under separate requirements and is not part of this section.
13. Removal off-site of hazardous materials or contaminated soil when encountered will be performed under separate requirements and is not part of this section.
14. Providing adequate dust control during all earthwork activities and in activities in which earthwork related work specified elsewhere. Dust control shall be in accordance with the ESMMP.

1.03 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Section 02100: Site Preparation
- B. Section 02500: Paving and Curbing
- C. Section 02350: Pressure Injected Footings
- D. Section 02202: Erosion Control
- E. Section 02220: Excavated Soil Material Management Plan
- F. Section 02210: Health and Safety

1.04 SUBMITTALS: Issue submittals in accordance with General Conditions and Division 1 general requirements. Submittals in this sections shall include:

A. General

1. The Contractor shall submit the information specified herein to the Engineer for review. Unless otherwise specified, submittals shall be made not less than three weeks before the start of the work.
2. Specifics of proposed compaction equipment, including description and specifications.

B. Backfill Samples

1. Deliver to the Engineer at least five working days prior to use, a representative bag sample for each proposed backfill material. Each sample shall be clearly labeled as to source of material, proposed

use, date of delivery, and shall weigh approximately 50 lbs.

C. Characterization of All Off-Site Borrow Sources and Borrow Materials

1. The following information shall be submitted to the Engineer for review at least three weeks prior to use as an off-site borrow source. No soil materials shall be brought to the site without approval by the Engineer.

a. Site Data: Information regarding the off-site borrow source and material, as follows:

- i. location of the site;
- ii. present and past usage of the source site and material;
- iii. any previously existing report(s) associated with an assessment of the source site as relates to the presence of oil or hazardous materials;
- iv. location within the site from which the material will be obtained.

b. Testing for Off-site Borrow Materials

- i. In the event that site characterization of off-site borrow sources indicates that soils are acceptable for use, then chemical testing will not be required. It is not anticipated that chemical testing would be required for customarily utilized commercial borrow sources. However, if the site characterization data or materials are suspected of being contaminated, chemical testing will be required as directed by the Engineer. The chemical testing shall be done by the Contractor at no additional cost to the Owner.
- ii. Chemical Test Data: Each material source, requiring testing shall be sampled by a person experienced in sample collection who is a professional engineer registered in the State of Massachusetts, registered professional geologist, certified groundwater

or environmental professional, or duly authorized representative thereof. Samples of each material shall be submitted to a chemical analytical laboratory, certified by the Massachusetts Department of Environmental Protection, for the following analyses:

- o Volatile Organic Compounds, (EPA 8240 plus Hazardous Substance List (HSL) Parameters);
- o Acid and Base Neutral Extractable Organic Compounds (EPA 8270);
- o Pesticides/PCBs (EPA 8080);
- o Total Petroleum Hydrocarbons (Infrared Method) (EPA 9071/418.1);
- o Thirteen Priority Pollutant Metals (EPA 7000 Series);
- o Total Cyanide (EPA 9010); and
- o Total Phenols (EPA 9065).

iii. Soil samples shall be obtained and tested in accordance with criteria established by the Engineer, and results submitted for review and approval prior to use on site.

D. Health and Safety Plan

1. A worker health and safety plan which includes levels of protection a schedule for training of Contractor's and Subcontractor's workers shall be submitted to the Engineer for review and approval a minimum of one week prior to beginning work.
2. The plan must be completed for discussion at the health and safety coordination meeting prior to the commencement of work.

1.05 QUALITY ASSURANCE AND CONTROL

- A. Refer to General Conditions and Division 1 general requirements, for general provisions covering material delivery, storage, and installation, and product substitutions.

- B. Field Monitoring and Testing: The Owner will retain the services of a Engineer to test, observe and document the Contractor's on-site earthwork activities to determine the work is completed in accordance with the Project Specifications and perform such other duties as are herein enumerated throughout these Specifications.

The Contractor's quality control of earthwork operations will be monitored by the Engineer. During subgrade preparation, and controlled filling operations, the Contractor shall cooperate with the Engineer in all respects to facilitate any testing or observations required. Said cooperation shall include, but is not limited to:

1. Notification, at least 36 hours in advance, for all earthwork operations.
 2. Access and proper facilities as required for testing and observation of all earthwork operations.
 3. Casual labor and materials as required to facilitate testing and observation of earthwork operations.
- C. All fill materials and their placement will be subject to quality control testing. The Contractor will bear the cost incurred by the Owner or the Engineer of any and all tests which are needed to correct previously unacceptable work. Test results and lab recommendations will be available to the Contractor.
- D. Tolerances
1. Construct finished soil and backfill surfaces to plus or minus 1/2-inch of the elevations indicated.
 2. Maintain the moisture content of fill material as it is being placed within plus or minus two percent of the optimum moisture content of the material as determined by the laboratory tests specified herein.
 3. Compaction of backfill shall be to at least the percentage indicated in this Section.
- E. No earthwork materials will be accepted on the job site unless indicated in writing by the Engineer, or other authorized representative of the Owner.
- F. No backfill shall be placed or compacted except in the presence of the Engineer.

- G. The Engineer, after receipt of samples of proposed fill and/or backfill materials from the Contractor, will conduct laboratory testing as necessary to determine if specified gradation requirements are met and to establish maximum laboratory dry densities and optimum moisture contents for field control tests during compaction operations. The Contractor shall allow a minimum of two (2) weeks for notification regarding parameters of compaction and of each material.
- H. Materials conforming to the requirements of paragraph 2.01 which are placed and compacted to less than the specified density shall alternatively be:
 - 1. Recompact as required to achieve the specified density.
 - 2. Removed and replaced with properly placed and acceptably compacted material.
- I. Materials placed and/or compacted which do not conform to project specifications for the area in which placed shall be removed and replaced with suitable material when directed by the Engineer at no additional cost to the Owner. The Contractor shall bear cost of any tests which are needed to correct previously unacceptable work.
- J. Approvals given by the Engineer shall not relieve the Contractor of his responsibility for performing the work in accordance with the Contract Documents.

1.06 REQUIREMENTS AND RESTRICTIONS

- A. All work shall comply with all rules, regulations, laws and ordinances of the State of Massachusetts, City of Boston, OSHA, and all other authorities having jurisdiction.
- B. The work shall comply with the Excavated Soil Material Management Plan (ESMMP) prepared by the Owner's consultant, Haley & Aldrich, Inc., for handling and disposal of on-site materials.
- C. The work shall comply with the site Health and Safety Plan.
- D. The Contractor shall coordinate and conduct his operations so as to interfere as little as possible with the use ordinarily made of roads, sidewalks, or other facilities.

- E. The Contractor shall conduct earthwork operations to control dust, noise, vibrations, and maintain clean streets accessing the site.

1.07 JOB CONDITIONS

A. Site and Subsurface Conditions

1. Subsurface investigation data are available from the Owner in a report entitled, "Report on Geotechnical Design Considerations, Building 2 Site, Proposed Ruggles Center Development, Boston, Massachusetts," dated October 1991, by Haley & Aldrich, Inc., Consulting Geotechnical Engineers, Geologists, and Hydrogeologists.

Data on chemical testing of on-site soils and groundwater are available from the Owner in the report entitled, "Report on Phase II Oil and Hazardous Material Site Investigation Parcel 18 and 18B," by Haley & Aldrich, Inc., dated 30 October 1989 and "Report on Phase IIA Oil and Hazardous Material Site Evaluation, Parcel 18B", by Haley & Aldrich, Inc. dated 9 April 1992.

Prior to submitting his bid, the Contractor shall review and understand the information contained in the reports. The geotechnical and environmental investigation reports are made available to the Contractor for information on factual data only and shall not be interpreted as a warranty of subsurface conditions whether interpreted from written text, boring logs, or other data.

2. The Contractor is advised that remains of foundations and slabs of structures and other miscellaneous rubble and trash were encountered below grade during the subsurface exploration program at the site. The extent and locations of all these structures have not been determined.
3. The Contractor is advised that the extent, and locations of all contamination may not have been determined.

1.08 LINES AND GRADES

- A. Lay out all lines and grade work not presently established at the site in accordance with Drawings and Specifications. Survey control shall be established by a Registered Land Surveyor or professional Civil Engineer. Maintain all established bounds and bench marks and replace as directed any which are destroyed or disturbed.
- B. The words "finished grades" as used herein shall mean the required final grade elevations indicated on the Drawings. Spot elevations shall govern over proposed contours.

1.09 UTILITY CLEARANCES AND PERMITS

- A. It shall be the responsibility of the Contractor to obtain required permits, licenses, and certificates from all authorities having jurisdiction over this work. Copies of these permits shall be submitted for review prior to the commencement of work.
- B. It is the responsibility of the Contractor to identify all active utilities in the vicinity of the construction. Utilities in adjacent ground and/or servicing structures in the vicinity of the work shall be maintained at all times during construction. Active utility lines damaged in the course of construction operations shall be repaired or replaced immediately at no cost to the Owner.
- C. Should uncharted piping or other utilities be encountered during excavation, consult the Architect and the utility owner immediately. Cooperate with the Architect and the utility owners in keeping services and facilities in operation.

PART 2 - PRODUCTS

2.01. MATERIALS

- A. Earth materials used as fill shall be as designated below.
- B. All off-site soil materials to be used as fill or backfill will be evaluated, based on information submitted by the Contractor to the Engineer, in accordance with current environmental practice in the State of Massachusetts. The evaluation will be based on site characterization data and/or, if required, chemical test results submitted by

the Contractor to the Engineer. Materials may be rejected for use based on the results of the evaluation. Off-site materials which are rejected for use, if brought to the site, shall be removed by the Contractor at his own expense.

- C. Crushed Stone: Crushed stone shall consist of clean, hard, durable natural rock, free of organic matter, rock dust and other contaminant and conforming to Massachusetts DPW specification M2.01.3.
- D. Gravel Base: Gravel base shall be sandy gravel or gravelly sand, free of organic material, loam, snow, ice, frozen soil and other objectionable materials, well graded within the following limits:

<u>U.S. Standard Sieve Size</u>	<u>Percent Finer by Weight</u>
3 in.	100
#4	40 - 75
#50	8 - 28
#200	0 - 8

- E. Compacted Granular Fill: Compacted Granular Fill shall be sandy gravel or gravelly sand, free of organic material, loam, snow, ice, frozen soil and other objectionable materials, well-graded within the following limits:

<u>U.S. Standard Sieve Size</u>	<u>Percent Finer by Weight</u>
6 in.	100
#4	30 - 85
#40	10 - 50
#200	0 - 8

- F. Common Fill: Common Fill shall be generated from excavated on-site material, in accordance with the ESMMP, and which meet gradation requirements listed below. No earth from off-site source shall be used as common fill without prior approval of the Engineer.

On-site excavation material approved by the Engineer, conforming to the ESMMP and conforming to the requirements of Common Fill may be stockpiled and reused as "Common Fill". On-site excavated material shall be screened as necessary to remove stones or building rubble larger than 6 in. in diameter.

Common Fill shall consist of well-graded mineral soil substantially free of organic materials, loam, wood, trash and other objectionable material which may be compressible or which cannot be compacted properly. Common Fill shall be unfrozen and shall not contain snow, ice or frozen materials. Common Fill shall not contain stones larger than six (6) inches in largest dimension and shall have physical properties such that it can be readily spread and compacted. Common fill placed within 12 in. below the bottom of structural slabs and within 12 in. of any concrete surface shall contain no stones larger than three (3) inches in largest dimension. Common Fill shall conform to Massachusetts DPW specification for Special Borrow, M1.02.0.

- G. Pipe Bedding Material: Bedding Material under and around utilities shall be natural mineral sand meeting Massachusetts DPW specification M1.04.1, or ASTM specification C-33, Fine Aggregate.

U.S. Standard
Sieve Size

Percent Finer by Weight

2 in.	100
2-1/2 in.	70 - 100
3/4 in.	50 - 85
#4	30 - 55
#50	8 - 24
#200	3 - 10

PART 3 - EXECUTION

3.01 INSPECTION OF SITE BY CONTRACTOR

- A. Examine the site and all work prepared by others and promptly report to the Owner in writing any conditions detrimental to the proper and timely completion of the work of this Section. Proceed with the work as soon as conditions are satisfactorily corrected in an acceptable manner.

3.02 GENERAL REQUIREMENTS

- A. Use/Disposal of Materials Found on the Site.
1. It is anticipated that some existing on-site fill materials may be suitable for use as Common Fill. If deemed suitable by the Engineer, the on-site material

shall be placed and compacted in a manner conforming to the applicable specifications for Common Fill.

2. It is anticipated that some existing on-site material may be contaminated. Requirements for handling, reuse and disposal of these materials are outlined in the ESMMP and summarized in Section 3-04 herein.
3. It is not anticipated that any on-site materials will conform to specified gradation requirements for Granular Fill or Crushed Stone. These materials, and others as needed, will have to be obtained from off-site sources. If deemed economically feasible and approved by the Engineer, the Contractor may segregate screened cobbles and utilize a crusher to produce crushed stone. Crushed stone produced on-site shall conform to specified gradation. It shall be the responsibility of the Contractor to perform sieve analysis testing as required by the engineer. Test results shall be provided to the Engineer at least 2 weeks prior to use on-site. Such testing will be at the Contractor expense.
4. All unsuitable material, and suitable material not required for the proper completion of the Contract, will become the property of the Contractor and shall be removed and properly disposed of away from the job site and in accordance with the ESMMP.
5. Do not excavate or remove any material from within the site which is not within the excavation, as indicated, without written authorization from the Engineer.

B. Maintenance of Excavations and Slopes

1. Stability of excavations and job safety are the sole responsibility of the Contractor.
2. Maintain soil slopes outside and inside the excavation. Promptly repair slides, slipouts, washouts, settlements and subsidences which occur for any reason, and refinish the slope or embankment to the original lines and grades or as required by the Engineer.
3. Shoring and bracing of trenches and other excavations shall be in accordance with the requirements of the Department of Labor Occupational Safety and Health Administration (OSHA) Document 29 CFR Part 1926 dated 31 October 1989.

- C. Prevent erosion on open cut slopes and berms at all times.
- D. Disperse travel paths of traffic and construction equipment over entire width of compacted surfaces to aid in obtaining uniform compaction. Protect exposed soil layers with high moisture content from excessive wheel loads.

E. Unfavorable Weather

1. Freezing Weather:

- a. Fill materials shall not be placed on snow, ice, frozen subgrades or uncompacted frozen soil.
 - b. Fill materials shall not be frozen when placed or be allowed to freeze prior to compaction. At the end of each day's work during freezing weather, the last lift of fill, after compaction, shall be rolled by a smooth-wheeled roller to eliminate ridges of uncompacted soil. The Contractor shall suspend backfilling operations when air temperatures are consistently below 32°, during the working day if so directed by the Engineer.
 - c. Do not excavate to full indicated depth when freezing temperatures may be expected, unless the mats, footing, or slab is poured immediately after the excavation has been completed. Protect the excavation from frost if placing of concrete is delayed. Concrete for foundations or slabs shall not be placed on frozen soil. Where slabs or mudmats are exposed to freezing temperatures, they shall be protected to prevent frost penetration into the soil upon which they rest. Where foundations are exposed over the winter during construction, provide at least two and one-half (2.5) feet of earth cover above the bottom surface of concrete, plus hay or other protection if temperatures are severe, as directed by the Engineer.
2. Wet Weather: If fill material placement, spreading, rolling or compaction operations are interrupted by heavy rain or other unfavorable conditions, do not resume such operations until ascertaining that the moisture content and density of the previously-placed soil are as required by these specifications.

3.03 CLEARING AND PREPARATION

- A. Remove and separate from excavated soil and properly dispose of all organic matter, asphalt paving, concrete and other non-soil materials encountered during site cleaning.
- B. Locate existing underground utilities in the areas of work. If utilities are to remain in place, provide adequate means of protecting during excavation operations.
- C. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult the utility owner immediately for directions. Cooperate with the Owner, and public utility service companies as required to keep their respective services and facilities in operation. Repair damaged utilities to the satisfaction of the utility owner.

3.04 ENVIRONMENTAL REQUIREMENTS

- A. Monitoring of Excavated Material: The quality of the excavated material will be monitored by the Engineer, who will serve as the Owner's Environmental Consultant who will monitor for visual and olfactory evidence of contamination. Field headspace screening will be performed on selected soil samples to aid in classification of soil.
- B. Health and Safety: If contamination levels detected by field screening exceed threshold criteria given in the Health and Safety Plan, then protective clothing and other precautions shall be undertaken by the contractor as outlined in his accepted Health and Safety Plan.
- C. Stockpiling of Excavated Material: All excavated material shall be classified and stockpiled for possible reuse or disposal prior to leaving the site. Stockpiling and rehandling is the responsibility of the Contractor. Excavated soil which is visibly contaminated shall be stockpiled separately from soil which is not visibly contaminated. The visibly contaminated soil shall be underlain and completely covered with polyethylene sheeting, and will be handled or disposed according to the requirements of the ESMMP.
- D. Chemical Testing: Representative soil samples from the stockpiled material will be chemically tested by the Owner during excavation to determine if the soil may be reused

on-site or if off-site disposal is required. All stockpiled material shall be tested prior to leaving the site according to testing requirements of the ESMMP. Stockpiled material must remain on site until chemical testing and evaluation is completed.

Contaminated material requiring off-site disposal shall be removed by a licensed Contractor, according to the requirements outlined in the ESMMP.

3.05 SUBSURFACE OBSTRUCTIONS

- A. An obstruction is defined as a buried structure or other object which interferes with earthwork construction or new foundations. Obstructions shall be removed from the excavated level to the subgrade level or to the bottom of the new pile cap. Obstructions required for deeper PIF installations are the responsibility of other Contractors. Excavations to remove obstructions below these levels may only be done as directed by the Engineer. Test Pits and Borings encountered wood, bricks, cobblestones, boulders, cinders, steel, asphalt, and concrete in the fill materials.
- B. All buried structures which are removed below the subgrade level shall be backfilled with compacted granular fill or lean concrete fill as acceptable to the Engineer, and appropriate to the construction.
- C. When making excavation for obstruction removal, do not undermine mat foundation or encroach within a 1:1 slope extending from outer edge of the mat foundation.
- D. All holes left by abandoned PIF installations shall be backfilled with compacted granular fill to the subgrade level.
- E. The Contractor shall not be separately compensated for obstruction removal. The cost for obstruction removal shall be included in unit prices and costs for earthwork items.

3.06 EXCAVATION

A. General

- 1. Excavation consists of the removal and disposal or stockpiling of materials encountered when establishing

the required limits and grade elevations, including but not limited to soil, utilities, and other buried structures. Excavate deeper as required.

2. Conform to the elevations and dimensions shown on the drawings, extending a sufficient distance from pile caps, mat foundation, and foundation walls to permit subgrade compaction, placing and removal of concrete formwork, installation of services, other construction, and for monitoring.
3. All excavated rubble and abandoned utility lines and other materials excluding soil shall become the property of the Contractor and shall be removed from the site and legally disposed of.
4. Plug permanently any abandoned utility lines and sewers encountered during the excavation with concrete plugs at least six (6) inches thick at a point outside the building lines.

B. Structure Excavation

1. Conduct excavation using appropriate methods and equipment in sufficient quantity and sizes to perform the work as specified and as shown on the Drawings.
2. Excavate to El. 11 within area of pile cap and two feet beyond perimeter indicated on drawings.
3. Coordinate the sequence of excavation with the pile installation and new utility construction.
4. Prevent disturbance to all soil subgrades. Use smooth-edged bucket as necessary to prevent disturbance. Remove unstable bottom material and remove large stones, debris and unsuitable soil from excavation bottoms as directed by the Engineer.
5. Remove unsuitable (and excess suitable) excavated material from the excavation promptly. Do not stockpile excavated or off-site material immediately outside the site limits or within the zone of lateral stress influence adjacent to the temporary lateral support systems.
6. Limits of the excavation shall allow for adequate working space for installing forms and as required for safety of personnel.

7. Exercise care to preserve the material below and beyond the lines of all excavations. Where excavation is carried below indicated grade, backfill to the indicated grade as specified herein.

C. Unauthorized Excavations

1. Unauthorized excavation consists of removal of materials beyond required subgrade elevations or dimensions without specific direction of the Engineer. Unauthorized excavation, as well as remedial work directed by the Engineer, shall be at the Contractor's expense.
2. Excavation beyond the required limits for the convenience of the Contractor and subsequent backfill shall conform to backfill and compaction requirements, limits acceptable to the Engineer and shall be at no additional expense to the Owner.
3. Backfill and compact unauthorized excavations with fill materials as specified for authorized excavations unless otherwise directed by the Engineer.

D. Additional Excavations

1. When excavation has reached required subgrade elevations, notify the Engineer who will observe the excavation and bearing conditions.
2. If unsuitable bearing materials are encountered at the required subgrade elevations, carry excavations deeper and replace the excavated material with Granular Fill as directed by the Engineer.
3. If unsuitable materials encountered at subgrade elevations are due to the Contractor's operations (such as soil disturbance caused by improper dewatering procedures or excavation procedures), then the additional excavation and replacement as directed by the Engineer shall be conducted at the Contractor's expense.

E. Utility Trench Excavation

1. Excavate trenches to the geometry lines and grades indicated on the Drawings for the particular item to be installed.

2. Perform excavation operations in trenches in general conformance with "OSHA Standards and Interpretations, Subpart P - Excavation, Trenching and Shoring."
3. Prepare the bottom of the trench excavation to receive bedding material and pipes in accordance with respective specifications for utilities to be placed in the trenches.
4. Where an obstruction is encountered, and deemed by the Engineer to remain in place, carry the trench excavation six (6) inches below the required elevation and backfill with a six inch (6") layer of Pipe Bedding Material prior to installing pipe.
5. Grade bottoms of trenches as indicated, notching under pipe bells to provide solid bearing for the entire body of the pipe.

F. Disposal and Stockpiling of Material

1. Stockpiling and disposal of excavated material shall be in accordance with the ESMMP.
2. The Owner will be responsible for sampling and testing materials to assess the disposal requirements. The Contractor will be responsible for arranging for disposal and payment for disposal of materials which require off-site transportation (special handling) under a Bill of Lading and/or Uniform Hazardous Waste Manifest under regulations of the Massachusetts DEP.
3. The Contractor shall coordinate all disposal activities as required to complete the work described in this Section. The Contractor shall be responsible for the legal disposal off site of all excavated materials.
4. The Contractor will be responsible for on-site stockpiling of excavated material suitable for use as backfill.

3.07 TEMPORARY EXCAVATION SUPPORT

- A. It is the responsibility of the Contractor to provide safe and stable excavations in earth and rock at all times during construction until the permanent structures shown on the Drawings have been constructed/completed, achieve

adequate strength, and are accepted by the Engineer as being complete.

3.08 DEWATERING

- A. Dewatering shall be performed as required to conduct all work in the dry. Groundwater is not expected to be encountered during foundation construction. All excavations which encounter groundwater shall be halted immediately and the contractor shall inform the Engineer. The Engineer shall subsequently determine whether excavation shall continue.
- B. In an effort to minimize dewatering requirements the contractor shall divert surface runoff away from excavations and other areas requiring work in-the-dry by way of diversion ditches, swales and other means.
- C. All water which is collected during dewatering shall be handled, stored and disposed of according to the ESMMP.

3.09 SUBGRADE PREPARATION AND PROTECTION

A. General

Complete the excavations to the specified or indicated limits and required depths.

B. Proof Rolling Subgrades

- 1. Where specified herein, indicated on the Drawings or directed by the Engineer during construction, the Contractor shall proof roll subgrades prior to proceeding with work in the vicinity. Proof rolling of in-place fill shall be conducted in all building, parking and roadway areas following initial site clearing excavation or grading.
- 2. Proof rolling of subgrades for pavements shall consist of at least two (2) complete coverages over the designated area(s) with approved heavy compaction equipment or a fully loaded 10-wheel dump truck.
- 3. Soft spots in pavement subgrade areas detected by the Engineer shall be removed and replaced with compacted granular fill upon confirmation by the Engineer.

C. Preparation of Mat Subgrade

Compaction of mat foundation subgrade shall consist of a minimum of six passes of heavy vibratory compactor with vibration on at optimum energy. A Raygo 600 vibratory roller or equivalent equipment shall be used. The entire area of the mat foundation subgrade and a surrounding perimeter of minimum two foot width shall be given the full six passes coverage.

D. Cold Weather Protection

Protect frost susceptible subgrade soils against freezing when the atmospheric temperature is less than 35 degrees F. Should protection fail, remove frozen materials and replace with common fill or granular fill, as directed by the Engineer, at no cost to the Owner.

3.10 PLACEMENT AND COMPACTION OF MATERIALS

A. General

1. All fill and backfill materials brought to the site must be obtained from an Owner-approved borrow source(s).
2. All fill materials shall be placed "in-the-dry" on subgrades acceptable to the Engineer. The Contractor shall dewater excavated areas as required to perform the work, and in such a manner as to preserve the undisturbed state of the subgrade material. The Contractor shall drain away ponded areas as required to perform the placement of fill "in-the-dry."
3. During compaction operations, incidental compaction due to traffic by construction equipment other than used specifically in compaction operations will not be credited toward the required minimum coverages specified.
4. Bulldozers, trucks, and other mechanical contrivances used in placement of fill materials are expressly prohibited from approaching within 8 feet of backfilled building walls.
5. Compaction by puddling or jetting is prohibited.
6. Exercise care in the placement of backfill against walls and directly in contact with waterproofed or dampproofed structures such that stones contained in

the backfill do not damage waterproofing or dampproofing.

7. Repair any damage to waterproofing/dampproofing which occurs during placement and compaction operations at no additional cost to the Owner.
8. Control surface water runoff by ditches, sumps, sloped surfaces, to permit collection and removal efficiently and without disturbance to materials being placed.
9. Fill materials of the various types specified shall generally be placed and compacted within the limits and to the thickness indicated on the Drawings, unless otherwise specified.
 - a. Crushed Stone: Crushed stone shall be used as water line pipe-bedding and backfill.
 - b. Gravel Base: Gravel Base shall be used below paved roadways and parking areas.
 - c. Compacted Granular Fill: Compacted Granular Fill shall be placed as a minimum 6-in. thick layer below the floor slab, used as backfill and as shown on the drawings.
 - d. Common Fill: Common Fill shall be used in general as backfill around and beneath pile caps and foundation mat and walls, beneath areas that are designated to be landscaped, and in other areas where no designations have been made for other types of fill. It is anticipated that on-site excavated soil will be selectively re-used as common fill subject to the requirements set forth in the ESMMP.
 - e. Pipe Bedding Material: Pipe Bedding Material shall be used under and around site utilities as shown on the drawings.
10. Do not place fill material on surfaces that are muddy, frozen, or contain frost or ice.
11. Refer to Section 3.10.E for placement requirements and maximum thickness of lifts for fill materials.
12. Place fill materials evenly adjacent to structures to required elevations. Take care to prevent wedging action of backfill against structures by carrying the

material uniformly around the structure to approximately the same elevation in each lift.

13. Prior to placing fill materials, complete the specified ground surface and subgrade preparation for materials encountered at ground surface and at subgrade levels.
 14. Fill shall not be placed when the atmospheric temperature is less than 30 degrees, unless prior approval is given by the Engineer. In addition, during freezing weather, the following shall apply:
 - a. A layer of fill shall not be left in an uncompacted state at the close of a day's operations. Prior to terminating operations for the day, the final layer of fill, after compaction, shall be rolled with a smooth-wheeled roller to eliminate ridges of soil left by tractors, trucks and compaction equipment.
 - b. A layer of compacted fill shall not be placed on snow, ice, or soil that was permitted to freeze prior to compaction. Removal of these unsatisfactory materials will be required as directed by the Engineer.
 15. Placement of all specified fill materials shall be systematically conducted in the specified uniform layer thickness which is measured in all cases prior to compaction.
 16. Compaction of fill materials shall be conducted by a minimum of four (4) complete coverages with acceptable compaction equipment to a specified density which is expressed as a percentage of maximum dry density as determined by ASTM D1557.
- B. Backfill excavations as promptly as work permits, but not until completion of the following:
1. Acceptance by the Engineer of construction below finish grade including, where applicable, dampproofing, waterproofing, perimeter insulation (if any), and utilities.
 2. Completion of quality control testing, approval and recording locations of underground utilities.
 3. Removal of concrete formwork.

4. Removal of trash and debris.

C. Compaction Equipment

1. In all cases, the character, efficiency and acceptability of the Contractor's compaction equipment shall be subject to the approval of the Engineer based on observed or documented field performance.
2. Compaction in open areas shall be conducted with heavy equipment such as vibratory rollers producing to the compaction characteristics at least that of a Bomag BW14D, when operated at optimum rating.
3. Compaction beneath the mat foundation and on subgrade immediately adjacent to the mat shall be conducted with a Raygo 600 vibratory roller operated at optimum rating, or other heavy vibratory equipment producing equivalent energy, and acceptable to the Engineer.
4. Compaction in confined areas (against walls, footings, piers and in trenches) shall be conducted with acceptable equipment such as hand-guided vibratory compactors or mechanical tampers.

D. Moisture Control

1. The amount of moisture in any one layer of fill material shall be as uniform as practicable throughout. The upper limit of water content in materials shall be that which will permit handling and placing and will permit proper compaction to exceed a value of three (3) percentage points on the wet side of optimum water content as determined by ASTM D1557. The lower limit of water content shall not be less than two (2) percentage points below optimum water content. Material which is too wet, shall be spread and permitted to dry, assisted by mechanical agitation, if necessary, until the water content is reduced to a value within the specified limits.
2. Each layer of material which is too dry shall be sprinkled with water, and the water worked into the material by mechanical methods until a uniform distribution of moisture shall be accurately controlled in amount so that free water will not appear on the surface during or subsequent to compaction. Should excess water be applied to any part of the material, such that materials are too wet to obtain the specified compaction, the compaction

operations and all work on that section of placed material shall be suspended until the water content of the material is reduced to a value within the specified limits.

E. Placement and Compaction

1. Common Fill and Granular Fill

- a. Place in layers not to exceed nine inches loose thickness when utilizing heavy compaction equipment and in six inch layers loose thickness when utilizing light, hand-operated compaction equipment.
- b. Compact to at least 95 percent of maximum dry density.

2. Gravel Base Coarse and Crushed Stone

- a. Place in layers not to exceed eight inches loose thickness.
- b. Compact to at least 98 percent of maximum dry density.

3. Pipe Bedding

- a. Place in layers not to exceed 12 inches.
- b. Compact only with hand-operated compaction equipment to at least 95 percent of maximum dry density.

3.11 GRADING

- A. General: Perform all rough and finish grading required to attain the elevations shown on the Drawings.
- B. Grading Tolerances: Upon completion of required backfilling, compacting and grading, the grade surfaces shall conform to the following requirements and tolerances:
 - 1. General: Uniformly grade areas within limits of grading under this Section, including adjacent transition areas. Smooth finish surfaces within specified tolerances, compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.

2. Grade finish areas to receive topsoil to within not more than 2 in. above or below the required subgrade elevations.
3. Grading Surface of Fill Under Pavements, and Slabs (both within and outside of Building): Grade smooth and even, free of voids, compact as specified, and to the required elevation. Provide final grades within a tolerance of 1 inch.

C. Treatment After Completion of Grading

1. After grading is completed and the Engineer has finished his inspection, permit no further excavating, filling, or grading except with the approval of and inspection by the Engineer.
2. Use of all means necessary to prevent erosion of freshly graded areas during construction and until such time as permanent drainage and erosion control measures have been installed.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

- A. Earth excavation, backfilling, dewatering, supply with off-site select fill, and site grading to the lines and grades indicated on the plans will not be measured separately for payment.
- B. Excavation for the Contractor's convenience, unauthorized excavation outside the limits indicated and backfill of such excavations will not be measured for payment.
- C. Soil which is required to be disposed of off-site in an in-state landfill, or in an authorized out-of-state facility shall be measured by the cubic yard for payment as "SOIL DISPOSAL."

4.02 PAYMENT

- A. Payment for EARTHWORK and site grading to the limits and grades indicated on the plans shall be as part of the lump sum, all-inclusive basis for the furnishing of all plant, labor, equipment, appliances and materials and performing all operations in connection with earth excavation,

dewatering, backfilling, compaction and site grading in accordance with the contract documents.

- B. Materials; Crushed Stone, Gravel Base, Compacted Granular Fill, and Pipe Bedding Material, brought to the site will not be separately measured for payment. All costs in connection therewith will be considered incidental to the excavation and earthwork.
- C. Subgrade preparation will not be measured separately for payment. All costs in connection therewith will be considered incidental to the material to be placed on the subgrade.
- D. Payment for "SOIL DISPOSAL" shall include full compensation for employee protective clothing and decontamination, and handling, screening, loading, hauling and disposal costs for soil disposal in accordance with the respective unit costs designated for disposal alternatives.

END OF SECTION

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Appendix D

APPENDIX D

Health and Safety Specification

SECTION 02210
HEALTH & SAFETY

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

- A. The General Provisions of the Contract, including General and Supplementary Conditions and Division 1 General Requirements (if any), apply to the work specified in this Section.
- B. Examine all other sections of the Specifications for requirements which affect work of this Section, whether or not such work is specifically mentioned in this Section.
- C. Coordinate work with that of all other trades affecting or affected by work of this Section. Coordinate with such trades to assure the steady progress of all work under the Contract.

1.02 DESCRIPTION OF WORK

- A. Work included: Work to be done under this Section includes, but is not limited to, the following items including all labor, materials, equipment and services necessary and incidental to prepare and adhere to the requirements of a health and safety plan during execution of the work as specified herein.
 - 1. Preparation of a Health and Safety Plan (H&SP) for all workers engaged in work where exposure to contaminated soil or groundwater is possible. The Contractor shall prepare a plan for all Contractor personnel and workers at this site.
 - 2. Attendance at a health and safety coordination meeting prior to commencement of excavation work at the site.
 - 3. Training of workers in the use of respiratory equipment and other health and safety contingency actions.
 - 4. Providing health and safety equipment including protective clothing, respiratory equipment and monitoring instruments.

5. Decontaminating heavy construction equipment and tools utilized in the work prior to removal from the site.

B. Related Work Specified Elsewhere:

1. Section: 02200 Earthwork
2. Section: 02100 Site Preparation
3. Section: 02350 Pressure Injected Footings
4. Section: 02220 Excavated Soil Material Management Plan

1.03 RELATED DOCUMENTS

- A. "Site Assessment Study of Parcel 18 to Determine Potential of Hazardous Waste, for the Boston Redevelopment Authority (BRA)," dated August 1986, by WCH Industries of Waltham, Massachusetts.
- B. "Letter Report Relative to the Massachusetts Oil and Hazardous Materials Release Prevention and Response Act of 1983, Southwest Corridor Parcel 18, Roxbury, Massachusetts," dated 30 January 1987, for the BRA, by Rizzo Associates of Natick, Massachusetts.
- C. "Report on Preliminary Oil and Hazardous Material Site Evaluation, Parcel 18 Development, Boston, Massachusetts," dated September 1988, by Haley & Aldrich.
- D. "Report on Phase Two Oil and Hazardous Material Site Evaluation, Parcel 18 and Parcel 18B, Boston, Massachusetts," dated October 1989, by Haley & Aldrich, Inc.
- E. "Health and Environmental Risk Assessment, Parcel 18 and Parcel 18B, Boston, Massachusetts," dated October 1989, prepared for Haley & Aldrich, Inc., by Menzie and Associates for Metasystems, Inc.
- F. "Report on Phase IIA Oil and Hazardous Material Site Evaluation Parcel 18B, Boston, Massachusetts," dated April 1992, by Haley & Aldrich, Inc.
- G. "Report on Final Remedial Response Plan, Ruggles Center, Boston, Massachusetts," dated 24 July 1992, by Haley & Aldrich, Inc.

- H. "Report on Remedial Response Implementation Plan, Ruggles Center, Boston, Massachusetts, dated 11 August 1992, by Haley & Aldrich, Inc.

1.04 SPECIAL SITE CONDITIONS

- A. The work to be carried out under these specifications is on an approximate 185,150 sq. ft. site. The site is currently an undeveloped track of land adjacent to the Ruggles Station of the MBTA Orange Line in Roxbury, Massachusetts. Historical site development in the area included commercial structures by the late 1880s. By 1978, all structures on-site had been razed. Currently proposed development includes a nine-level building, surface parking and a public plaza.
- B. Various related documents are available to the Contractor. The documents summarize the results of subsurface explorations and testing of soil and groundwater samples on the site. In general, the soils and groundwater contain hydrocarbons relating primarily due to former site usage for automobile service stations and filling with soils from off-site localities. Soils and groundwater also contain low levels of pesticides believed to have been present in fill materials from an off-site source. The risk assessment found that contaminated soils and groundwater at the site, in its present state, did not pose a significant threat to human health and the environment. The Contractor shall review these documents and understand their contents.
- C. The contaminated soil is anticipated to be odorous when exposed during construction. The soil and groundwater contain compounds which when concentrated may present a health hazard for workers and others in the immediate vicinity who become exposed through direct contact and/or breathing.
- D. The purpose of this Health & Safety protocol is to insure that a means for adequate protection of individuals engaged in hazardous work is provided. The nature of the materials present at the site will require use of special protective clothing and the possible use of respiratory protective equipment which is intended to minimize worker exposure to known or suspected site hazards.
- E. Levels of personal protection are established in reference standards and are generally described for Levels C and D

in Part 2.01. Work to be conducted at the site is not anticipated to require personal protection above that provided by Level C which requires use of a respirator. If upgrading to Level B (self-contained breathing apparatus) protection is required, the work shall be suspended until the Contractor is equipped to continue the work.

1.05 REFERENCE STANDARDS

- A. NIOSH/OSHA/USCG/EPA: "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities," October 1985.
- B. OSHA: Part 29 CFR 1910.120, .132, .134, .146, .147, .1000-1046 and .1200.
- C. ACED: "Health and Safety Guidelines for Hazardous Waste Site Investigations."

1.06 QUALITY CONTROL

A. Ambient Air Monitoring

- 1. During excavation, the Owner's Representative will monitor air quality using photoionization detectors, explosion meters and organic vapor analyzers, as appropriate. The information collected using these instruments will be provided to the Contractor. Independent monitoring by the Contractor using equivalent instruments is required.

B. Health & Safety Oversight

- 1. Responsibility for implementation of the H&SP shall be the sole responsibility of the Contractor who shall also be responsible for implementation of the H&SP by all Subcontractors. The Contractor shall provide a Site Safety Office (SSO) who shall be assigned and present at the site at all times during all stages of site activity. The SSO shall be responsible for ensuring that the H&SP is properly implemented. The SSO will be charged with overseeing site health and safety, instrument monitoring, personnel and equipment decontamination, control of equipment check-out and emergency response.

Other responsibilities include monitoring dust levels and workers for weather-related exposures or stresses during their use of personal protective clothing and equipment (PPE).

2. The SSO shall have a working knowledge of State and Federal occupational safety and health regulations and formal training in occupational safety and health.
3. Prior to commencement of any site activities, the SSO shall review the H&SP and provide training on PPE use to all on-site employees who will be working in or near contaminated soil or groundwater. New employees or visitors to these areas shall be informed of the site conditions by the SSO. If visitors enter those areas, PPE and training required at that time within that area by the Contractor's personnel shall be required.

1.07 SUBMITTALS

- A. Submit the names, qualifications and experience of the following individuals identified by the Contractor for approval by the Owner's Representative prior to submittal of the H&SP.
 1. Certified Industrial Hygienist, certified safety professional or environmental health professional responsible for the preparation of the H&SP.
 2. Site Safety Officer.
- B. Submit a H&SP prepared by a qualified health professional experienced in working in contaminated environments. The plan shall include information on levels of protection and a schedule for training of Contractor's and Subcontractor's workers in the use of respiratory equipment and use of protective clothing to the Owner for review at least one (1) week prior to the start of work. Please note that training will not be provided by the Owner or his Representative.
- C. The H&S plan must be completed for discussion at the health and safety coordination meeting scheduled by the Contractor and held at least three (3) days prior to commencement of work, relating to possible exposure to

contamination at the site. The Contractor shall provide written notice of this meeting to all interested parties.

PART 2 - PRODUCTS

2.01 CLOTHING AND EQUIPMENT

- A. All clothing and equipment must conform to the OSHA and EPA requirements as indicated in the Reference Standards. Generally protective clothing is considered disposable, but respiratory equipment is reusable. The items to be furnished by the Contractor under different levels of required protection for their own personnel and Subcontractor's personnel include:

Level D Protection

- Coveralls (cotton) or Tyvek
- Safety boots/shoes
- Safety glasses
- Hard hat with optional faceshield
- Air purifying respirator (readily available, MSA Ultra-twin, or equal)

Level C Protection

- Full facepiece air-purifying respirator (MSA Ultra-twin or equal)
- Chemical protective overalls and long-sleeved jacket or Coveralls (Saran coated Tyvek)
- Gloves, inner (disposable surgical type)
- Gloves, outer (Neoprene, Nitrile, Viton or Butyl)
- Boots, chemical protective, steel toe and shank (Neoprene or Nitrile)
- Booties, chemical protective (disposable PVC)
- Hard hat
- Face shield (optional)

Levels B and A represent increased levels of protection and are described in the Reference Standards.

PART 3 - EXECUTION

3.01 HEALTH AND SAFETY PLANNING AND IMPLEMENTATION

- A. Prepare a plan which will ensure the health and safety of all workers engaged in work at the site at all times when exposure to contaminated soil or groundwater is possible. Implement the plan throughout the execution of the work.
- B. Should Level C protection be required during excavation(s) of contaminated soils the Contractor will be required to monitor the perimeter of the site using the equipment described in 1.06 (A).

Should background air quality levels measured at the site perimeter exceed ambient air quality levels, the Contractor will be required to continuously monitor any release off-site during the entire excavation period. Two downwind and one upwind portable sampling stations shall be established. Tenax or charcoal packed columns will be used to collect airborne organic vapors for analyses. Samples will be analyzed for volatile organic vapors (EPA Method 624) within 24 hours from collection.

- C. Require all workers who will be engaged in work at the site which might result in exposure to contaminated soil or groundwater to attend a health and safety coordination meetings.
- D. Provide adequate health and safety training for all personnel who may be coming in contact with or exposure to contaminated materials during the execution of the work.
- E. Personnel who have not received training, and who are not equipped with the required protective clothing and equipment, will not be permitted access to the site during execution of work which may result in exposure to contaminated soil or groundwater.

3.03 DECONTAMINATION

- A. Decontaminate all equipment and tools in accordance with the approved H&SP which have come in contact with contaminated soil and groundwater to prevent the spread of contamination outside the site limits.
- B. Dispose of all decontamination by-products in accordance with local, state and federal regulations.

- C. Decontamination of construction equipment shall include the steam-cleaning of all equipment which comes in contact with contaminated soil or groundwater, prior to leaving the job site. Soap and water decontamination of non-disposable worker protective equipment shall be performed.
- D. Provide on-site facilities for Contractor personnel to decontaminate their protective clothing or other equipment.

PART 4 - MEASUREMENT AND PAYMENT

The work described in this Section will not be measured, but will be included and paid for as part of the Contract Lump Sum Price.

END OF SECTION

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